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AS210-06
MICROWAVE FREQUENCY GENERATOR MODULE

OPERATION AND MAINTENANCE MANUAL

MP MASTER
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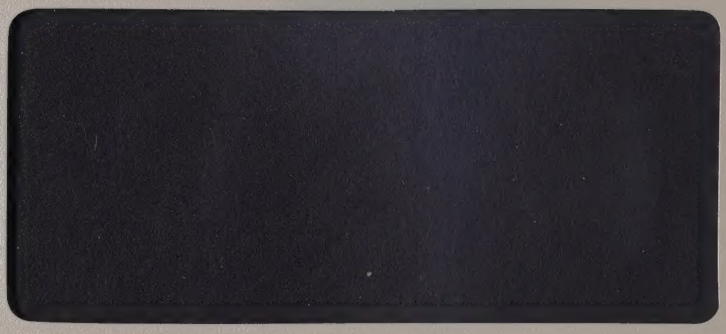
INSTRUMENTATION AND METROLOGY DIVISION



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AS210-06
MICROWAVE FREQUENCY GENERATOR MODULE

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PREFACE

This manual contains the installation, operation, and maintenance instructions for the AS210-06 Microwave Frequency Generator Module . The data contained herein is arranged as follows:

Section 1 General Information
Section 2 Installation
Section 3 Operation
Section 4 Theory of Operation
Section 5 Maintenance and Calibration
Section 6 Illustrated Parts List

REFERENCE PUBLICATIONS

MODEL NO.	PUBLICATION TITLE
AS210-PM	Portable Mainframe Operation and Maintenance Manual
AS210-RM, LM	Mainframe Operation and Maintenance Manual
AS210-01A	Module Controller Operation and Maintenance Manual
AS210-02	Frequency Comparator Operation and Maintenance Manual
AS210-03	Frequency Generator Operation and Maintenance Manual
AS210-04	Digital Delay Generator Operation and Maintenance Manual
AS210-05	Standby Battery Operation and Maintenance Manual
AS210-08	Distribution Amplifier Operation and Maintenance Manual
AS210-20	Time Clock Operation and Maintenance Manual

SECTION 1
GENERAL INFORMATION

1.1 INTRODUCTION

The AS210-06 Microwave Frequency Generator Module, illustrated in Figure 1-1, is a modular plug-in unit used in the ARGOSystems AS210 Electronic Counter and Frequency Standard Calibration System. This module is used for testing the amplitude and frequency specifications of microwave frequency counters. It provides output frequencies from 1 to 18 GHz in 1 GHz increments with selectable output power levels from -5 to -35 dBm in 5 dB steps. An internal ALC circuit combined with the leveling detector at the end of a low-loss flexible microwave cable provides an output power-level accuracy at the load of better than $\pm$2 dB over a 30 dB dynamic range.

The AS210-06 is compatible with either the AS210A-PM Portable Mainframe, the AS210-RM Rackmount Mainframe, or the AS210-LM Laboratory Mainframe. The AS210-06 is programmable through the IEEE-488 interface in the AS210-01A Module Controller. Descriptions of other modules of the AS210 series are provided in separate publications referenced in the preface and available from ARGOSystems.

1.2 PHYSICAL AND ELECTRICAL DESCRIPTION

The AS210-06 Microwave Frequency Generator Module is modularly constructed for insertion into a compatible AS210 mainframe. The module's front panel contains a thumbwheel switch for selection of operating frequency, a rotary switch for selection of output level, a CAL LED, a precision N output signal connector, and a BNC leveling signal connector.

Figure 1-1 AS210-06 Microwave Frequency Generator Module

Internally, the module consists of one each of the following:

- 1 GHz phase-locked oscillator (PLO)
- 1 GHz, 1 watt amplifier
- YIG tuned multiplier
- YIG coil driver
- Microwave switch
- Printed circuit card for control circuitry.

The 1 GHz PLO is phase-locked directly to the 10 MHz output frequency from the Rubidium frequency standard provided by the AS210 mainframe. The 1 GHz PLO has two outputs. The first is the RF sample port, which the microwave switch and control circuitry switches directly to the output connector of the module. The second output is the RF output port, which is amplified and delivered to the input YIG tuned multiplier. Harmonics of the 1 GHz input signal from 2 to 18 GHz are available at the output of the YIG tuned multiplier. The YIG coil driver selects the desired harmonic, which the microwave switch directs to the output connector of the module. At the output connector of the module, all 18 output frequencies from 1 to 18 GHz are available.

A 3-foot flexible cable assembly comprised of a low-loss microwave cable and BNC leveling cable is attached to the AS210-06. At the end of the low-loss cable assembly is a leveling detector. The leveling detector contains a 3 dB power divider and a microwave detector for the precision ALC loop. The final leveled output of the microwave frequency generator is the RF OUT port of the leveling detector.

The frequency and level controls are scanned periodically by the microprocessor in the AS210-01A Module Controller. The data is returned to the AS210-06 Microwave Frequency Generator Module in the form of commands for selecting operating points for the ALC and YIG tuning circuits. Table 1-1 is an equipment specification for the AS210-06 installed in a compatible AS210 Mainframe with the AS210-01A Module Controller.

Table 1-1

AS210-06 EQUIPMENT SPECIFICATIONS

FEATURES	VALUES
OUTPUT FREQUENCIES	
RANGE	1 to 18 GHz
STEP SIZE	1 GHz
FREQUENCY ACCURACY	
VS TEMPERATURE	$\pm 6 \times 10^{11}$ maximum
VS TIME	$\pm 2 \times 10^{11}$ per month
SPURIOUS	
SECOND HARMONIC	20 dB minimum below desired frequency output
THIRD- AND HIGHER-ORDER HARMONICS	30 dB minimum below desired frequency output
NONHARMONIC	30 dB minimum below desired frequency output
OUTPUT LEVELS	
RANGE	- 5 to -35 dBm 1 to 8 GHz -10 to -35 dBm 8 to 12 GHz -15 to -35 dBm 12 to 18 GHz
STEP SIZE	5 dB
ACCURACY	± 2 dB
OUTPUT CHARACTERISTICS	
IMPEDANCE	50 ohms
VSWR	Less than 2:1
CONNECTOR	Precision N, male, at leveling head (3-foot cable supplied to connect output to leveling head)
PHYSICAL CHARACTERISTICS	
OPERATING TEMPERATURE	+10 to 40°C
SIZE	Single width plug-in
WEIGHT	6 lb.

SECTION 2
INSTALLATION

2.1 INTRODUCTION

The AS210-06 Microwave Frequency Generator Module plugs into a compatible AS210 Mainframe. The module is electrically connected through a rear edge connector and mechanically retained with a front panel locking bar.

NOTE

Because of the high retention force of the rear card edge connector, the LEVEL switch knob may need to be pulled at the same time as the release mechanism is pulled, to remove the AS210-06 Microwave Frequency Generator Module from the mainframe (see Figure 3-1).

NOTE

The power in the AS210 Mainframe must be OFF when inserting or removing the AS210-06 Microwave Frequency Generator Module.

CAUTION

AS210 series plug-ins will not work in Tektronix TM-500 series mainframes. Severe damage will result if operation in this mode is attempted.

Power and signal interface is provided through the mainframe. The 3-foot, low-loss microwave cable assembly and leveling detector are connected as shown in Figure 2-1.

The flexible cable assembly and leveling head connect to the AS210-06 as shown in Figure 2-1.

NOTE

When installing the low-loss microwave cable assembly and ARGOSystems Leveling Detector, please observe the following:

1. The low-loss microwave cable has a minimum bend radius of 1.5 inches. If the cable is bent to less than the 1.5 inch minimum radius, the cable's electrical performance will be degraded, and failure could result.

2. The connector mating force for the Precision N connectors of the low-loss microwave cable should be 8 to 12 pounds.

3. Do not use the cable assembly as a handle.

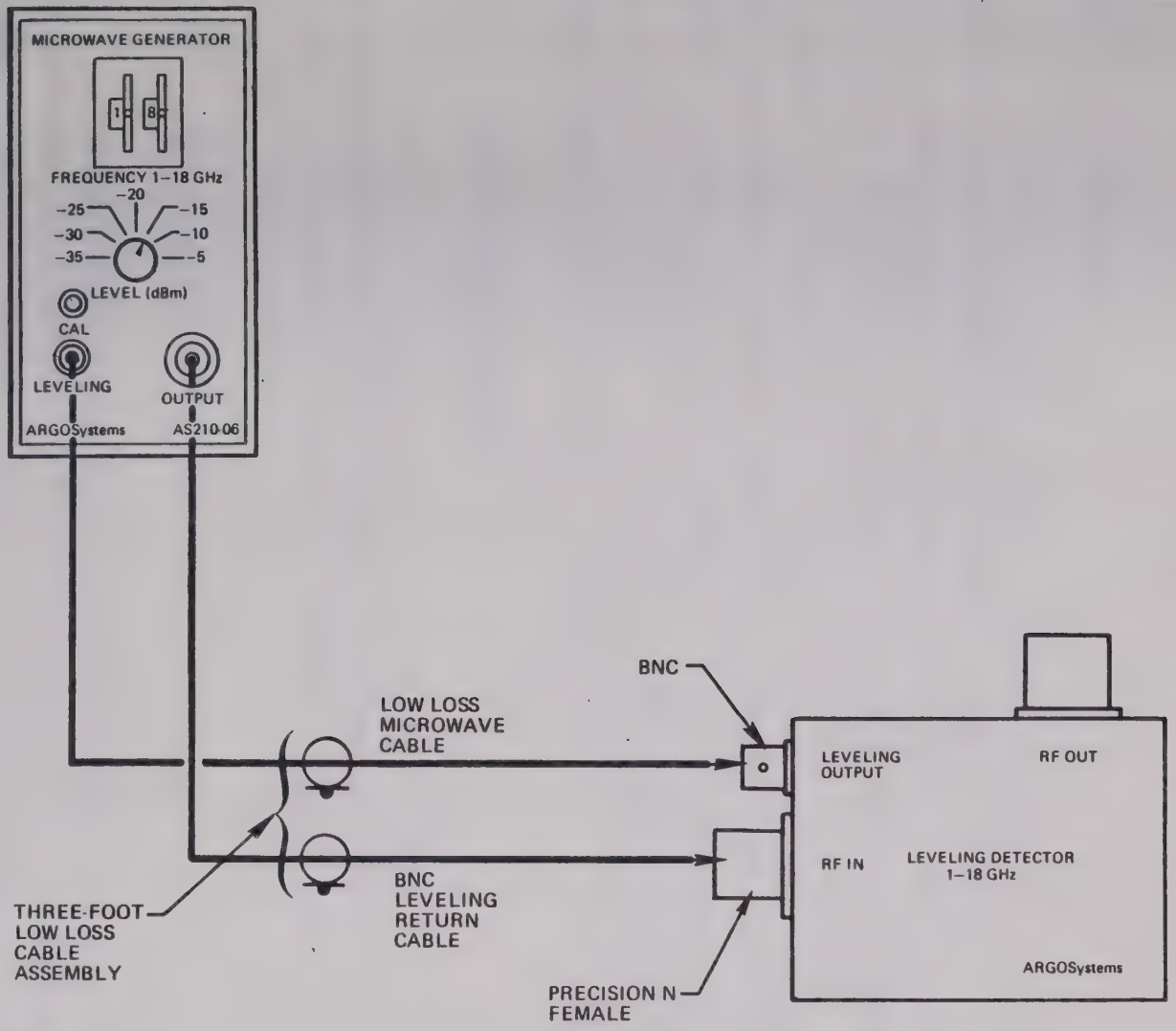

Figure 2-1 Connect Diagram for AS210-06 3-Foot Low-Loss Cable Assembly and for Leveling Detector

SECTION 3
OPERATION

3.1 INTRODUCTION

This section contains operation data and instructions for the AS210-06 Microwave Frequency Generator Module. Operator interface is provided through two controls, two connectors, and an LED on the front panel of the module. The AS210-06 is designed to be used with the AS210-01A Module Controller. However, this interface is transparent to the user of the AS210-06. The AS210-06 operating software, located in the AS210-01A, has a YIG filter calibration software routine that is executed upon detecting an unleveled output signal. This software routine will self-calibrate the YIG filter tuning in the AS210-06 during normal operating conditions. Section 5, Maintenance and Calibration, explains the self-diagnostic capability of the AS210-06 when used with the AS210-01A Module Controller.

3.2 CONTROLS AND CONNECTORS

Figure 3-1 is a front panel view of the AS210-06 Microwave Frequency Generator Module with indexed numbers keyed to Table 3-1. Figure 3-2 is a top view of the leveling detector showing connectors and indexed numbers keyed to Table 3-2.

3.3 OPERATING INSTRUCTIONS

The AS210-06 Microwave Frequency Generator Module is connected to the instrument under test via the RF OUT port located on the leveling detector assembly. The RF OUT port is a precision N male connector that will mate directly with the input connector found on most microwave counters used today. If the input connector of the instrument under test is not a type N female

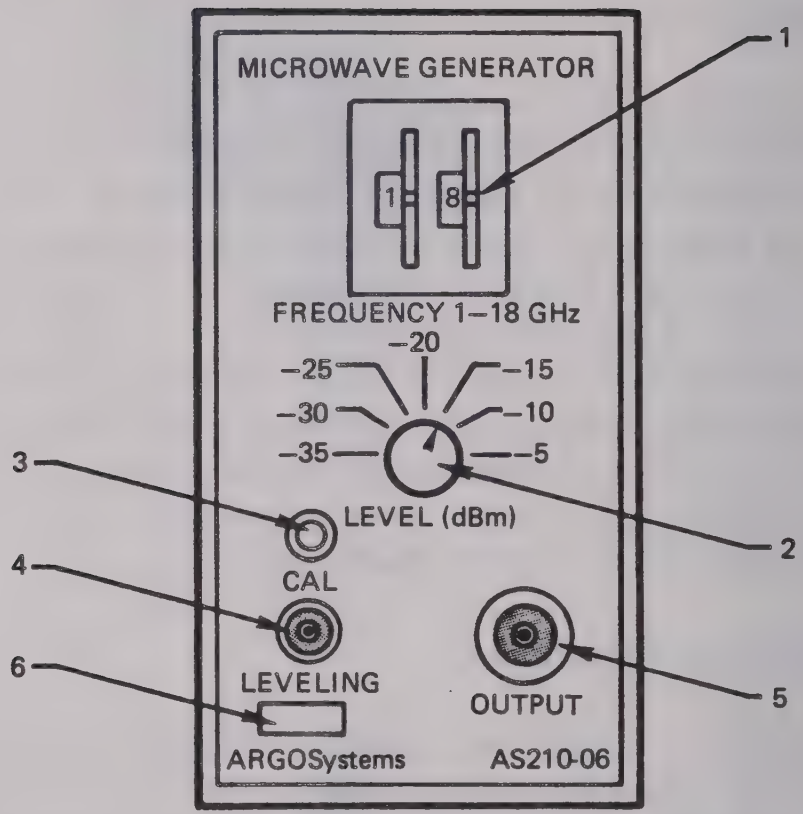

Figure 3-1 AS210-06 Module Front Panel Controls and Connectors

Table 3-1
AS210-06 MODULE FRONT PANEL CONTROLS AND CONNECTORS

INDEX NUMBER (Figure 3-1)	PANEL MARKING	FUNCTION
1	FREQUENCY 1 to 18 GHz	Selects one of 18 standard frequencies: 1 to 18 GHz in 1 GHz increments. NOTE: 00 and 19 are not valid operating frequencies and will result in an error condition.
2	LEVEL (dBm)	Selects one of nine output levels: -5 to -35 dBm in 5 dB increments.
3	CAL	Calibration mode LED.
4	LEVELING	ALC return signal input from leveling detector (BNC cable).
5	OUTPUT	Module output connector to RF IN port on leveling detector (low-loss microwave cable).
6	None	Release mechanism.

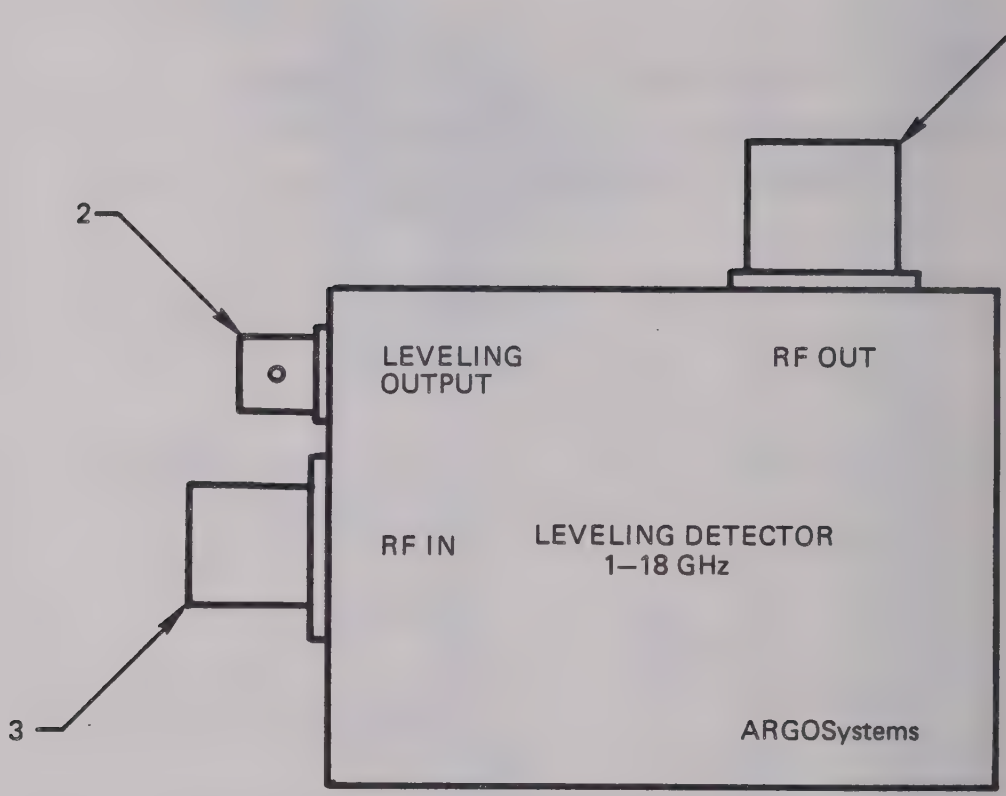

Figure 3-2 AS210-06 Leveling Detector Connectors

Table 3-2
AS210-06 LEVELING DETECTOR CONNECTORS

INDEX NUMBER (Figure 3-2)	PANEL MARKING	FUNCTION
1	RF OUT	Output connector (to instrument under test)
2	LEVELING OUTPUT	ALC return signal to LEVELING BNC on AS210-06 front panel (BNC cable)
3	RF IN	Input connector from module output connector (low-loss microwave cable).

or precision type N female, then an appropriate between-series adapter will have to be used. Select the desired output frequency with the thumbwheel switch, and choose the required output level with the rotary switch. The CAL LED will flash approximately once per second if the YIG filter calibration routine has been initiated. When the AS210-06 Microwave Frequency Generator Module has recalibrated the output signal, the CAL LED will stop flashing and will remain off. The AS210-06 is now ready to perform the desired test. If the AS210-06 is not able to generate the desired output signal level, the CAL LED will stop flashing and will remain lit. The AS210-01A Module Controller will sense this fault and will display an error code. If this condition occurs, consult Section 5, Maintenance and Calibration.

SECTION 4
THEORY OF OPERATION

.1 INTRODUCTION

This section provides a description of the circuits used in the S210-06 Microwave Frequency Generator Module. The circuit description is eyed to the functional block diagram (Figure 4-1) and the schematic diagrams ncluded in Section 5. Details of common type circuits (such as power upplies) are not included in this description.

.2 OVERALL DESCRIPTION

The AS210-06 Microwave Frequency Generator Module consists of the ront panel controls and connectors (A4), a control circuit card assembly A2), and a microwave subsystem (A1, A5, A6, A7). Figure 4-1 is a functional lock diagram of the module, depicting how the generator produces standard requency outputs of 1 to 18 GHz in 1 GHz increments over a 30 dB dynamic ange.

The AS210-06 front panel controls select the desired frequency and utput level. These front panel controls are interrogated by the AS210-01A odule Controller via the microprocessor interface circuitry located on the ontrol circuit card assembly (A2). The AS210-01A then reads two 12-bit ords from the AS210-06, corresponding to the level and frequency desired.

NOTE

The calibration EPROM is matched to the AS210-06 module and the leveling detector and should not be interchanged with other

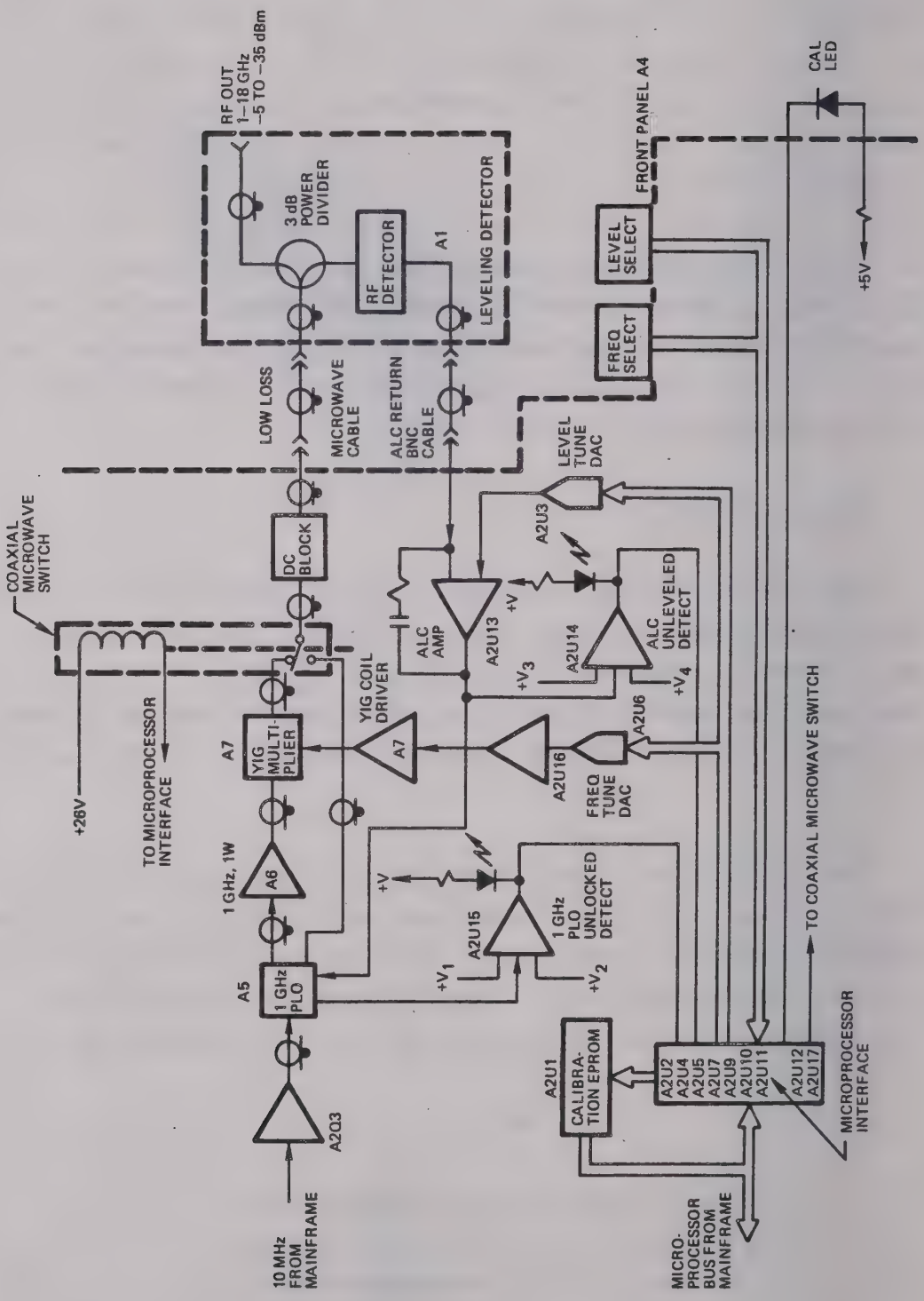

Figure 4-1 Microwave Frequency Generator Module Functional Block Diagram

calibration EPROMs. Automatic calibration software and test fixture are available from ARGOSystems to calibrate and load EPROMs. Consult the factory for additional information.

he AS210-01A then loads these two words back to the AS210-06 control ircuitry. If the AS210-01A determines that the AS210-06 is operating in n unleveled condition, the YIG filter tuning calibration software routine ill find the new operating words for the AS210-06 and will reload this nformation to the control circuitry.

The control circuit card assembly consists of the microprocessor nterface (A2U2, A2U4, A2U5, A2U7, A2U9, A2U10, A2U11, A2U12, A2U17), a alibration EPROM (A2U1), a frequency tune digital-to-analog converter DAC) (A2U6), a frequency tune driver amplifier (A2U16), a level tune DAC A2U3), an ALC amplifier (A2U13), a 1 GHz PLO unlocked detect comparator A2U15), an ALC unleveled detect comparator (A2U14), a 10 MHz (A2Q3) amp- ifier for the 1 GHz reference frequency, and power supply circuitry (A2U18, 2U19).

The microwave subsystem consists of the 1 GHz PLO (A5), the 1 GHz watt amplifier (A6), the YIG tuned multiplier (A7), a coaxial microwave witch, a DC block, a low-loss flexible cable assembly, and an ARGOSystems evel detector. The level detector contains a 3 dB power divider and RF etector.

.3 FREQUENCY GENERATION CIRCUITRY

The output frequencies of the AS210-06 Microwave Frequency Generator odule are generated by the microwave subsystem (A1, A5 - A7) and selected by he control circuit card assembly (A2). The 10 MHz signal from the Rubidium requency standard in the AS210 Mainframe is amplified on the control circuit ard assembly (A2) and used as the reference frequency for the 1 GHz PLO (A5).

The 1 GHz PLO has two outputs. The first output is the RF sample port, which the microwave switch and control circuitry switches directly to the output connector of the module. The second output is the RF output port, which is amplified by the 1 GHz, 1 watt power amplifier (A6) and is used to drive the input port of the YIG tuned multiplier (A7).

The YIG tuned multiplier contains a step recovery diode (harmonic generator) matched to a YIG bandpass filter. Harmonics of the 1 GHz input signal from 2 to 18 GHz are available at the output of the YIG tuned multiplier, and the desired output signal is selected by the YIG coil driver. The frequency tune DAC (A2U6) located on the control circuit card assembly accepts the 12-bit frequency tuning word from the AS210-01A Module Controller and tunes the YIG coil driver to select the desired output harmonic. The 2 to 18 GHz band is switched to the module output connector by the microwave switch and control circuitry.

A DC block is included on the output of the microwave switch to prevent any low-level DC signals from feeding through to the output and offsetting the precision ALC circuitry.

The full 1 to 18 GHz output frequency range of the AS210-06 is available at the output connector of the module. The desired output signal is delivered to the level detector (A1) by a low-loss flexible cable. The level detector contains a 3 dB power divider and microwave detector. The output power is divided in half, with one portion being used as the output signal of the system and the other half being detected for the precision ALC circuitry.

4.4 LEVEL CONTROL CIRCUITRY

The precision ALC circuitry of the AS210-06 is located on the control circuit card assembly (A2). The level tune DAC (A2U3) accepts the 12-bit level tuning word from the module controller and creates a voltage

eference for the ALC amplifier (A2U13). The ALC amplifier (A2U13) is a recision operational amplifier designed to be an integrator. This amplifier drives a voltage-controlled attenuator located in the 1 GHz PLO (A5) in uch a way as to make the detected RF power (a dc voltage) the same value as he voltage reference created by the level tune DAC (A2U3). The detected RF ower is fed back from the level detector through a BNC cable to the input of he ALC amplifier on the control circuit card assembly.

.5 SELF-TEST CIRCUITRY

Two self-test signals are available to the AS210-01A Module ontroller via the AS210 Mainframe motherboard. The first is a 1 GHz PLO nlocked detect signal, which will be indicated as an error message on the S210-01A display. The second is an ALC unleveled detect signal, which, if he AS210-06 is in the 2 to 18 GHz band, will initially start the YIG filter uning calibration software routine in the AS210-01A. If the YIG filter uning calibration fails to level the output power, an error message will be hown on the AS210-01A display. If the AS210-06 is in the 1 GHz band, the LC unleveled detect signal will result in an error message on the AS210-01A isplay. Refer to Section 5, Maintenance and Calibration, for information bout clearing any error messages while operating the AS210-06 Microwave requency Generator Module.

NOTE

The AS210-06 leveling detector must be terminated into 50 ohms during self-test. If the unit is not terminated into 50 ohms, false error codes may result.

SECTION 5
MAINTENANCE AND CALIBRATION

5.1 INTRODUCTION

This section provides maintenance and calibration data for the AS210-06 Microwave Frequency Generator Module. Part I covers routine preventive maintenance procedures. Part II outlines performance tests. Part III contains the calibration/ alignment procedures for the AS210-06, and Part IV describes troubleshooting data. Figures 5-4 and 5-5 are the schematic diagrams of the AS210-06. Please contact the factory for any assistance required in the maintenance or servicing of the AS210-06.

PART I

PREVENTATIVE MAINTENANCE

5.2 PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Table 5-1 lists preventive maintenance checks and services that should be performed regularly.

Table 5-1

PREVENTIVE MAINTENANCE CHECKS AND SERVICES

ITEM	PROCEDURE
CABLES	Visually inspect cables for strained, cut, frayed, or otherwise damaged insulation.
CLEANLINESS	Make sure the exterior surfaces of the unit are clean. If necessary, clean exterior surfaces as follows: a. Using a clean, soft cloth, remove the dust and loose dirt. b. Using a brush, remove dust or dirt from plugs and jacks. WARNING Use only warm soapy water for cleaning all plastic parts. Many solvents will cause the plastic to become brittle.
CORROSION	Make sure exterior surfaces of the unit are free of rust and corrosion.
PRESERVATION	Inspect exterior surfaces of the unit for chipped paint or corrosion. If necessary, spot-paint surfaces as follows: a. Remove rust and corrosion from metal surfaces by lightly sanding them with sandpaper. b. Brush two coats of paint on base metal to protect it from further corrosion.

PART II
PERFORMANCE TESTING

5.3 OVERVIEW

Part II describes the procedure to test the AS210-06 Microwave Frequency Generator Module to ensure proper performance of the instrument. The AS210-06 must be used in conjunction with the AS210-01A Module Controller because the CPU in the AS210-01A monitors the controls and output of the AS210-06. The AS210-06 will not operate without the AS210-01A installed. If the AS210-06 fails any of these performance tests, please see Part III, Calibration/Alignment Procedures, or Part IV, Troubleshooting Procedures.

5.4 RF OUTPUT FREQUENCY PERFORMANCE TEST

The following is a procedure for testing the 18 selectable output frequencies of the AS210-06 Microwave Frequency Generator Module. Table 5-2 contains the required equipment to perform this test.

Table 5-2

REQUIRED TEST EQUIPMENT FOR THE
INTERNAL FREQUENCY STANDARD ACCURACY TEST

ITEM	RECOMMENDED TEST EQUIPMENT
MICROWAVE ELECTRONIC FREQUENCY COUNTER	EIP 548 or Hewlett-Packard 5342A or 5343A
COAXIAL CABLE	3 ft long, 50 ohm, BNC

5.5 TEST PROCEDURE

A. Ensure that power is disconnected from the AS210 system before beginning this procedure.

B. Connect the equipment as indicated in Figure 5-1, and apply power to the AS210. The Rubidium frequency standard in the AS210 system will require 20 minutes warm-up time to reach the specified frequency accuracy.

C. Select the -15 dBm output power level on the AS210-06 front panel. Starting with 1 GHz dialed into the thumbwheel switch for the output frequency, compare the frequency displayed by the microwave counter to Table 5-3 to verify that the output frequency is within the acceptable frequency range for 1 GHz. Continue this process through the remaining 17 output frequencies available from the AS210-06. If any of the frequencies fall out of the limits for acceptable performance, please see Part III, Calibration/Alignment Procedures, or Part IV, Troubleshooting Procedures.

D. Disconnect the microwave frequency counter from the AS210-06.

5.6 RF OUTPUT LEVEL PERFORMANCE TEST

The following is a procedure for testing the seven RF output levels for each of the 18 selectable output frequencies of the AS210-06. The footnotes to Table 5-4 give the required equipment for this performance test.

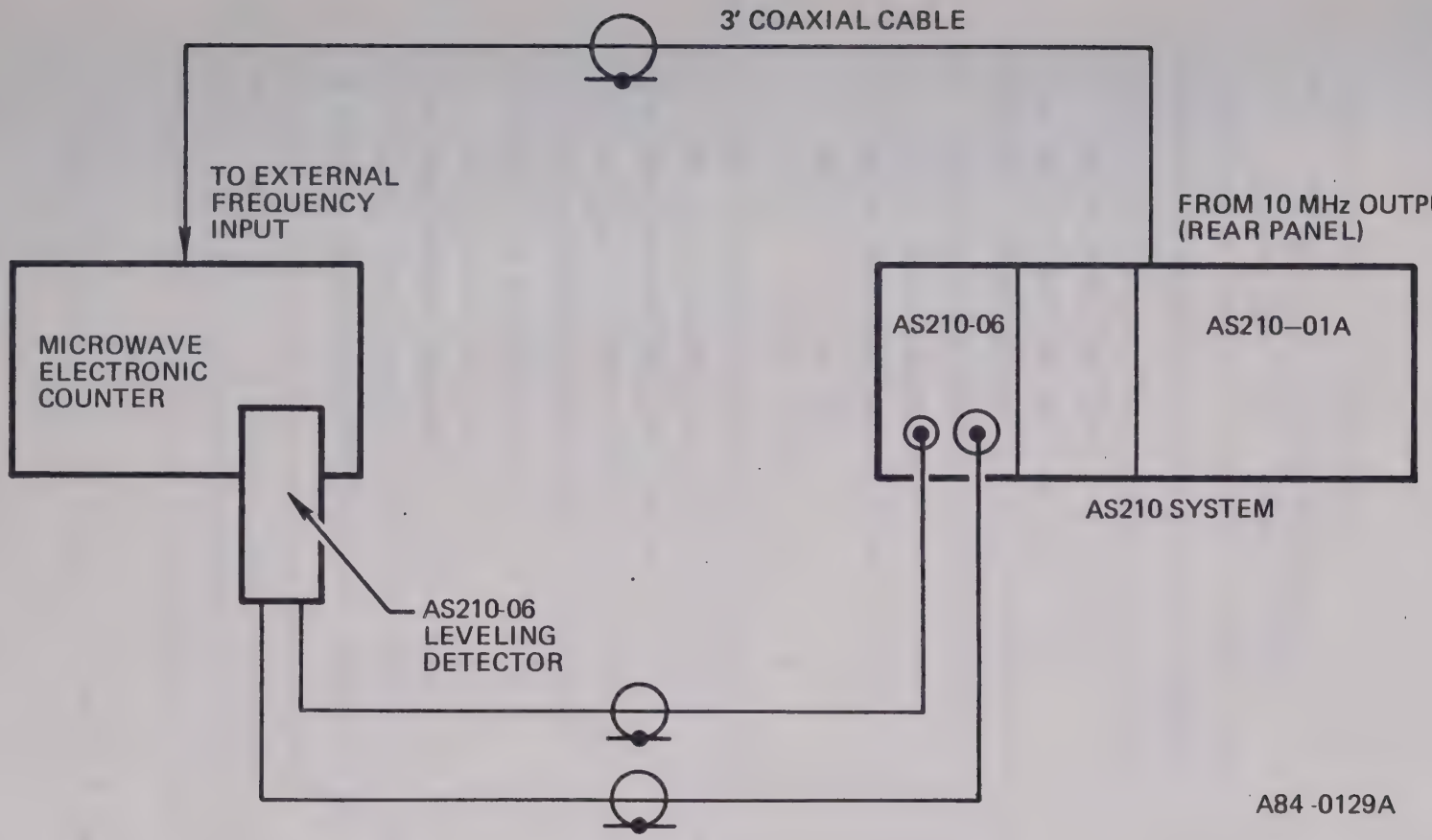

Figure 5-1 AS210-06 Microwave Frequency Generator Module RF Output Frequency Test Configuration

Table 5-3

MINIMUM PERFORMANCE LIMITS FOR
RF OUTPUT FREQUENCIES OF THE AS210-06

FREQUENCY (GHz)	ACCEPTABLE FREQUENCY RANGE
1	1,000,000,000 Hz ±1 Hz
2	2,000,000,000 Hz ±1 Hz
3	3,000,000,000 Hz ±1 Hz
4	4,000,000,000 Hz ±1 Hz
5	5,000,000,000 Hz ±1 Hz
6	6,000,000,000 Hz ±1 Hz
7	7,000,000,000 Hz ±1 Hz
8	8,000,000,000 Hz ±1 Hz
9	9,000,000,000 Hz ±1 Hz
10	10,000,000,000 Hz ±1 Hz
11	11,000,000,000 Hz ±1 Hz
12	12,000,000,000 Hz ±1 Hz
13	13,000,000,000 Hz ±1 Hz
14	14,000,000,000 Hz ±1 Hz
15	15,000,000,000 Hz ±1 Hz
16	16,000,000,000 Hz ±1 Hz
17	17,000,000,000 Hz ±1 Hz
18	18,000,000,000 Hz ±1 Hz

.7 TEST PROCEDURE

A. Ensure that power is disconnected from the AS210 system and the HP power meter before beginning this procedure.

B. Connect the equipment as indicated in Figure 5-2. Use an HP8481A Power Sensor as the power head. Turn power on to the AS210 system and the HP power meter. Wait for the AS210-01A Module Controller to display SEL?. If the AS210-01A responds with an error message, consult Part III, Calibration/ Alignment Procedures, or Part IV, Troubleshooting Procedures. Note that ERR 0-00 indicates that the Rubidium frequency standard in the AS210 system is not phase locked and will require a maximum of 20 minutes warm-up time to achieve phase lock.

C. Starting with 1 GHz as the selected output frequency of the AS210-06 and -5 dBm as the desired output level, the microwave power meter should read between -3 and -7 dBm for acceptable performance. Next, change the output frequency to 2 GHz and repeat the measurement. Continue this process through 8 GHz.

D. Return the output frequency to 1 GHz. Change the output level to -10 dBm. The microwave power meter should read between -8 and -12 dBm. Repeat this procedure through 12 GHz.

E. Return the output frequency to 1 GHz. Change the output level to -15 dBm. The microwave power meter should read between -13 and -17 dBm. Repeat this procedure through 18 GHz.

F. Turn power off to both the HP power meter and the AS210 system.

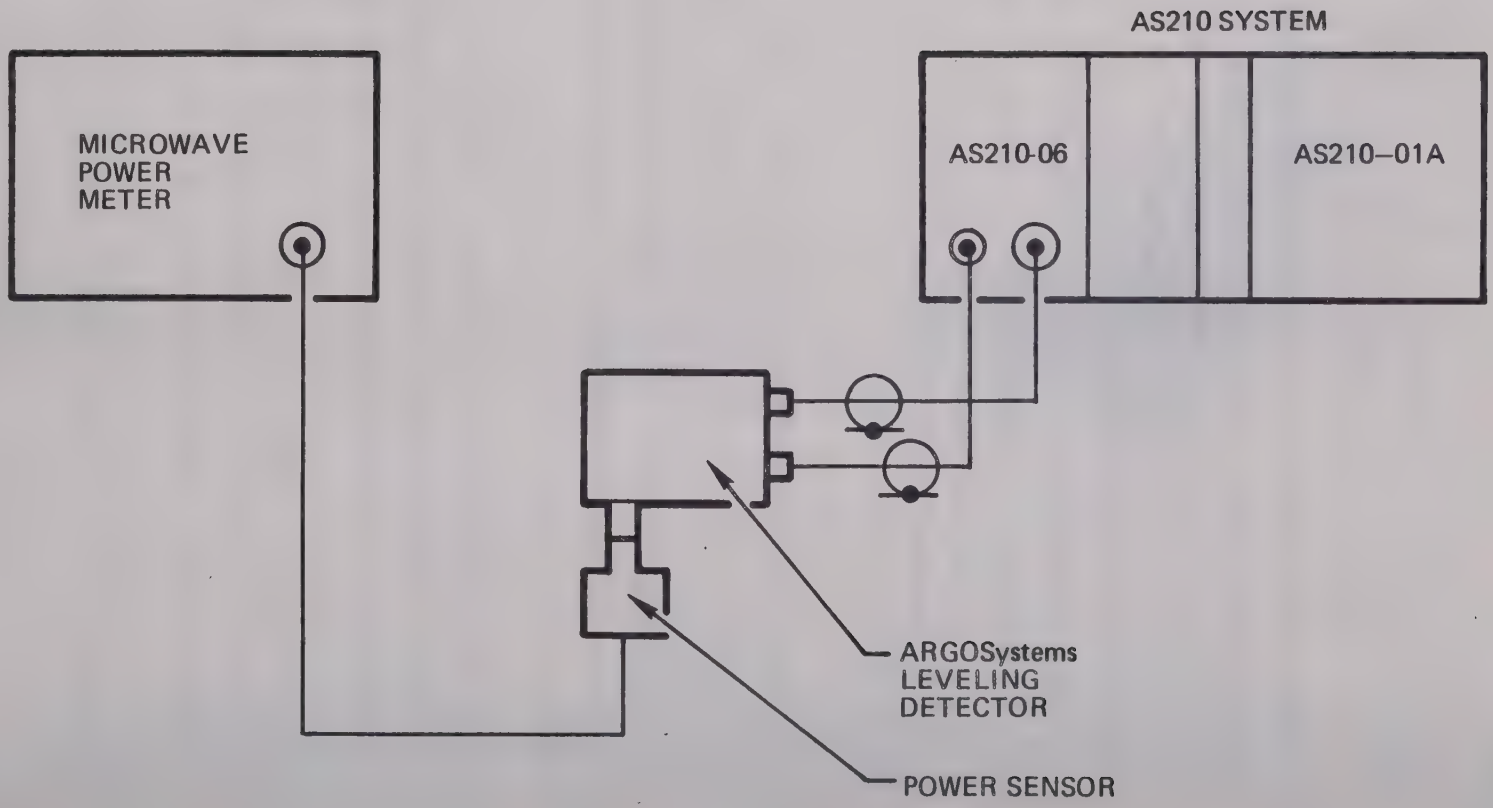

Figure 5-2 AS210-06 Microwave Frequency Generator Module RF Output Level Test Configuration

G. Connect the equipment as indicated in Figure 5-2. Use an HP8484A Power Sensor as the power head. Turn power on to the AS210 system and the HP power meter. Wait for the AS210-01A Module Controller to display SEL?. If the AS210-01A responds with an error message, consult Part III, Calibration/ Alignment Procedures, or Part IV, Troubleshooting Procedures. Note that ERR 0-00 indicates that the Rubidium frequency standard in the AS210 system is not phase locked and will require a maximum of 20 minutes warm-up time to achieve phase lock.

H. Turn the output frequency to 1 GHz. Change the output level to -20 dBm. The microwave power meter should read between -18 and -22 dBm. Repeat this procedure through 18 GHz.

I. Return the output frequency to 1 GHz. Change the output level to -25 dBm. The microwave power meter should read between -23 and -17 dBm. Repeat this procedure through 18 GHz.

J. Return the output frequency to 1 GHz. Change the output level to -30 dBm. The microwave power meter should read between -28 and -32 dBm. Repeat this procedure through 18 GHz.

K. Return the output frequency to 1 GHz. Change the output level to -35 dBm. The microwave power meter should read between -33 and -37 dBm. Repeat this procedure through 18 GHz.

L. Table 5-4 is a listing of the minimum performance limits for the RF output level measurements of the AS210-06. If any of the levels fall out of the range for acceptable performance, see Part III, Calibration/Alignment Procedures or Part IV, Troubleshooting Procedures.

M. Disconnect the microwave power meter from the AS210-06.

Table 5-4

MINIMUM PERFORMANCE LIMITS FOR RF OUTPUT LEVEL OF THE AS210-06

OUTPUT FREQUENCY (GHz)	-5 dBm*		-10 dBm*		-15 dBm*		-20 dBm†		-25 dBm†		-30 dBm†		-35 dBm†	
	MIN (dB)	MAX (dB)	MIN (dB)	MAX (dB)	MIN (dB)	MAX (dB)	MIN (dB)	MAX (dB)	MIN (dB)	MAX (dB)	MIN (dB)	MAX (dB)	MIN (dB)	MAX (dB)
1	-7	-3	-12	-8	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
2	-7	-3	-12	-8	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
3	-7	-3	-12	-8	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
4	-7	-3	-12	-8	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
5	-7	-3	-12	-8	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
6	-7	-3	-12	-8	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
7	-7	-3	-12	-8	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
8	-7	-3	-12	-8	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
9	-	-	-12	-8	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
10	-	-	-12	-8	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
11	-	-	-12	-8	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
12	-	-	-12	-8	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
13	-	-	-	-	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
14	-	-	-	-	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
15	-	-	-	-	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
16	-	-	-	-	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
17	-	-	-	-	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33
18	-	-	-	-	-17	-13	-22	-18	-27	-23	-32	-28	-37	-33

*USE HP 8481A POWER SENSOR

†USE HP 8484A POWER SENSOR

PART III
CALIBRATION/ALIGNMENT PROCEDURES

5.8 OVERVIEW

WARNING

The following calibration/alignment procedures (Section 5, Part III) and Troubleshooting Procedures (Section 5, Part IV) are for use by qualified personnel only. To avoid personal injury, do not perform any servicing other than that of routine maintenance (Section 5, Part I) and performance testing (Section 5, Part II) unless you are qualified to do so.

Figure 5-3 is a flow diagram of the Calibration/Alignment Procedure for the AS210-06 Microwave Frequency Generator Module. Use this flow diagram with the theory of operation in Section 4, the text in this section, and the illustrated parts lists in Section 6. The AS210 internal frequency standard calibration data, contained in the AS210 mainframe operation and maintenance manual, is also referenced in this flow diagram. Note that the AS210 system need not be disassembled to determine if calibration/alignment is necessary. For any assistance needed in performing this calibration/alignment procedure, please contact the factory.

5.9 ACCESS TO AS210-06 MICROWAVE FREQUENCY GENERATOR MODULE

Please refer to the AS210 mainframe manual for the AS210 system disassembly procedure allowing access to the AS210-06 Microwave Frequency Generator Module. Access to the module circuitry itself is gained by using a small straight-blade screwdriver to remove the two metal sidecovers. Place the module on one of its sides so that one cover is facing up.

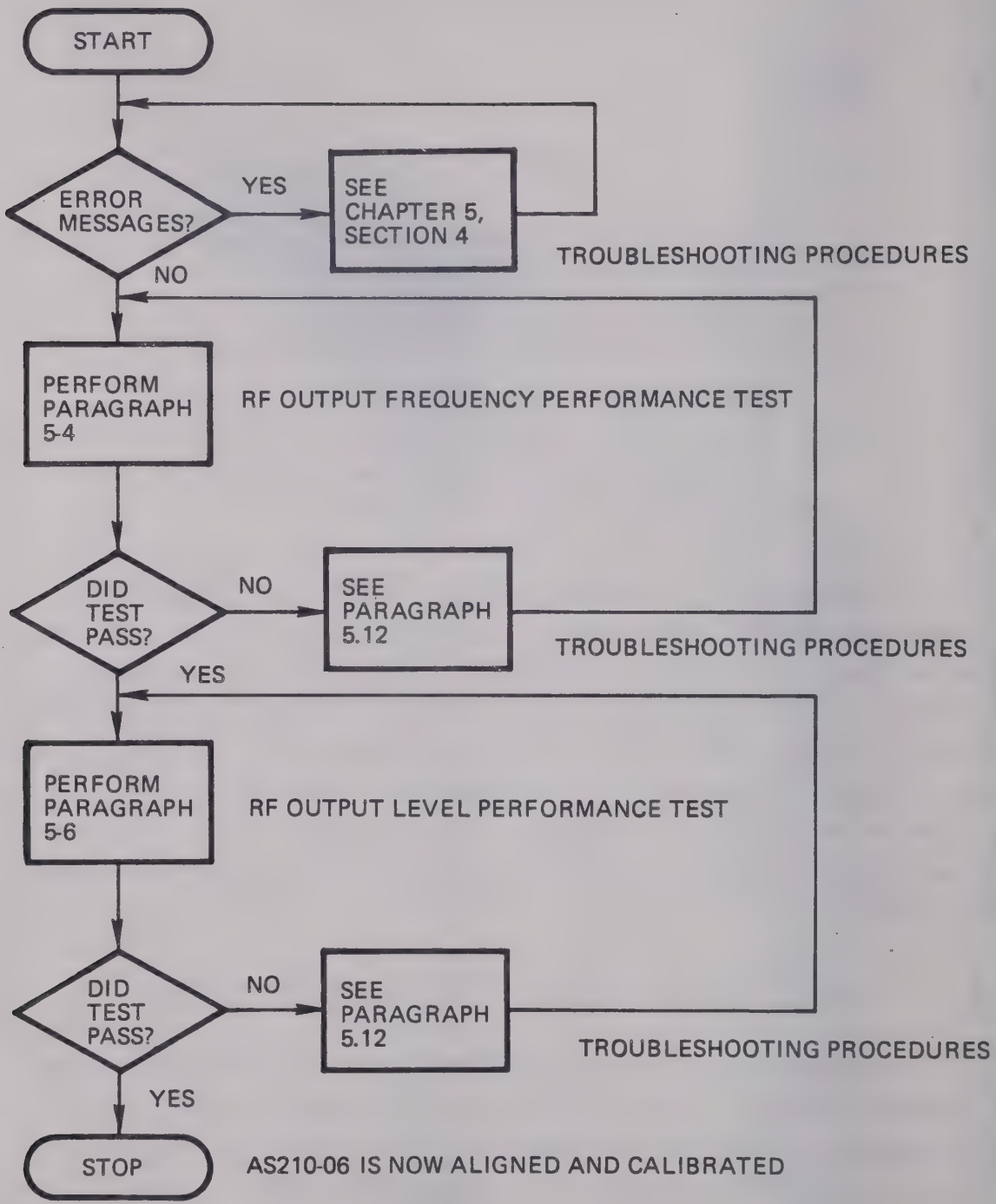

Figure 5-3 Flow Diagram of the Calibration/Alignment Procedure for the AS210-06 Microwave Frequency Generator Module

tarting with the end toward the edge connector, insert the screwdriver into ne of the slots where the cover mates with the module chassis, and pry the over up. You must move along the slot toward the front panel of the module nd repeat the prying action to loosen the side of the cover from the module. epeat this technique to free the other side cover from the chassis. Set the ree cover clear of the module, and flip the module over so that the second over is now facing up. Repeat the above procedure to free this cover.

.10 +15V POWER SUPPLY ALIGNMENT

The AS210-06 has two adjustable voltage supplies on the control ircuit card. Table 5-5 lists the test equipment recommended to align the 15 volt supplies. To align the voltages' supplies, use the following rocedure:

A. Obtain access to the AS210-06 by using the procedure described in Section 5-9.
B. Monitor the +15 volt supply with the digital voltmeter (DVM) at test point 15V on A2.
C. Adjust A2R28 until the DVM reads +15 ±0.25 volt.
D. Monitor the -15 volt supply with the DVM at test point 15V on A2.
E. Adjust A2R31 until the DVM reads -15 ±0.25 volt.
F. Remove the DVM, and reassemble the AS210-06.

Table 5-5

REQUIRED TEST EQUIPMENT FOR
+15 VOLT POWER SUPPLY ALIGNMENT

ITEM	RECOMMENDED TEST EQUIPMENT
DIGITAL VOLTMETER	Hewlett-Packard 3455A

PART IV
TROUBLESHOOTING PROCEDURES

5.15 OVERVIEW

Troubleshooting the AS210-06 Microwave Frequency Generator Module is facilitated by a combination of error codes displayed on the module controller display and by LED indicators on the control circuit card assembly, A2. The control circuit card is illustrated in Figure 6-3. Table 5-6 correlates the error code, displayed on the module controller when a fault occurs, to the malfunction. An explanation of the problem is provided with possible solutions. Table 5-7 is a list of visual indicators on Circuit Card A2 and of the indicators' meaning. Figures 5-4 and 5-5 are the schematic diagrams of the AS210-06. For further assistance, contact the factory.

NOTE

The AS210-06 leveling detector must be terminated into 50 ohms during self-test. If the unit is not terminated into 50 ohms, false error codes may result.

Table 5-6

ERROR CODE LISTING

ERROR CODE	PROBLEM	RECOMMENDED SOLUTION
ERR 6-00	Frequency not available	Select proper output frequency.
ERR 6-0X	No leveling loop indication at frequency X X = 1 1 GHz X = 2 2 GHz X = 3 3 GHz . . . . . . X = 9 9 GHz	The AS210-06 may require 10 minutes warm-up time to stabilize the YIG multiplier and associated circuitry. After 10 minutes warm-up, initiate self-test from the front panel of the AS210-01A Module Controller. If the same error condition occurs during or after self-test, or both, then check the ALC circuitry A2U3, A2U13, A2U14, A2Q1, and A2Q2. Also check the microwave switch control circuitry A2U11 and A2U17.
ERR 6-1X	No leveling loop indication at frequency X X = 0 10 GHz X = 1 11 GHz X = 2 12 GHz . . . . . . X = 8 18 GHz	Same as ERR 6-0X.
ERR 6-30	1 GHz source not locked	Check 10 MHz amplifier A2Q3; output should be approximately 0 dBm.
ERR 6-40	Calibration in progress	None. Let calibration routine finish.
ERR 6-50	Unable to level, and level chosen is greater than guaranteed by performance specifications	Select proper output power level.

Table 5-7

VISUAL INDICATIONS

INDICATOR	PROBLEM	RECOMMENDED SOLUTION
A2CR1	ALC Unleveled	Check A2U3, A2U13, A2Q1, A2Q2, A2U14, and A2U16.
A2CR2	PLO Unlocked	Check A2Q3 and A2U15.
CAL LED (Front Panel)	Calibration Program Initiated	Normal operation; see Section 3 for description.

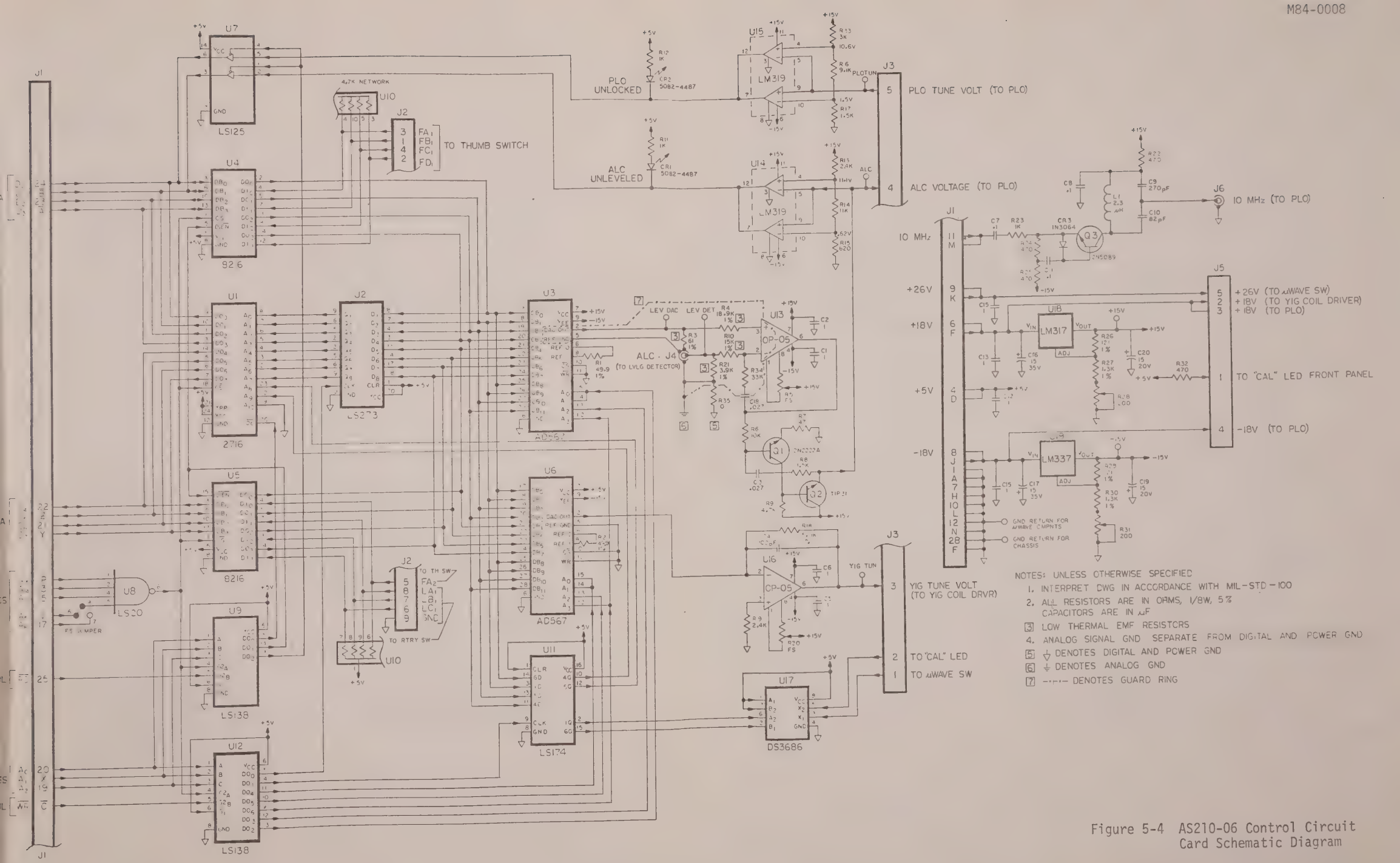
PLO UNLOCKED
ALC UNLEVELED
PLO TUNE VOLT (TO PLO)
ALC VOLTAGE (TO PLO)
10 MHz (TO PLO)
TO THUMB SWITCH
+26V (TO μWAVE SW)
+18V (TO YIG COIL DRIVER)
+18V (TO PLO)
TO "CAL" LED FRONT PANEL
-18V (TO PLO)
YIG TUNE VOLT (TO YIG COIL DRVR)
TO "CAL" LED
TO μWAVE SW
ALC - J4 (TO LVLG DETECTOR)
LEV DAC
LEV DET
GND RETURN FOR μWAVE CMPNTS
GND RETURN FOR CHASSIS
FS JUMPER
TO TH SW
TO RTRY SW
NOTES: UNLESS OTHERWISE SPECIFIED
1. INTERPRET DWG IN ACCORDANCE WITH MIL-STD-100
2. ALL RESISTORS ARE IN OHMS, 1/8W, 5%
CAPACITORS ARE IN μF
3 LOW THERMAL EMF RESISTORS
4. ANALOG SIGNAL GND SEPARATE FROM DIGITAL AND POWER GND
5 ⏚ DENOTES DIGITAL AND POWER GND
6 ⏚ DENOTES ANALOG GND
7 -·-·- DENOTES GUARD RING

Figure 5-4 AS210-06 Control Circuit Card Schematic Diagram

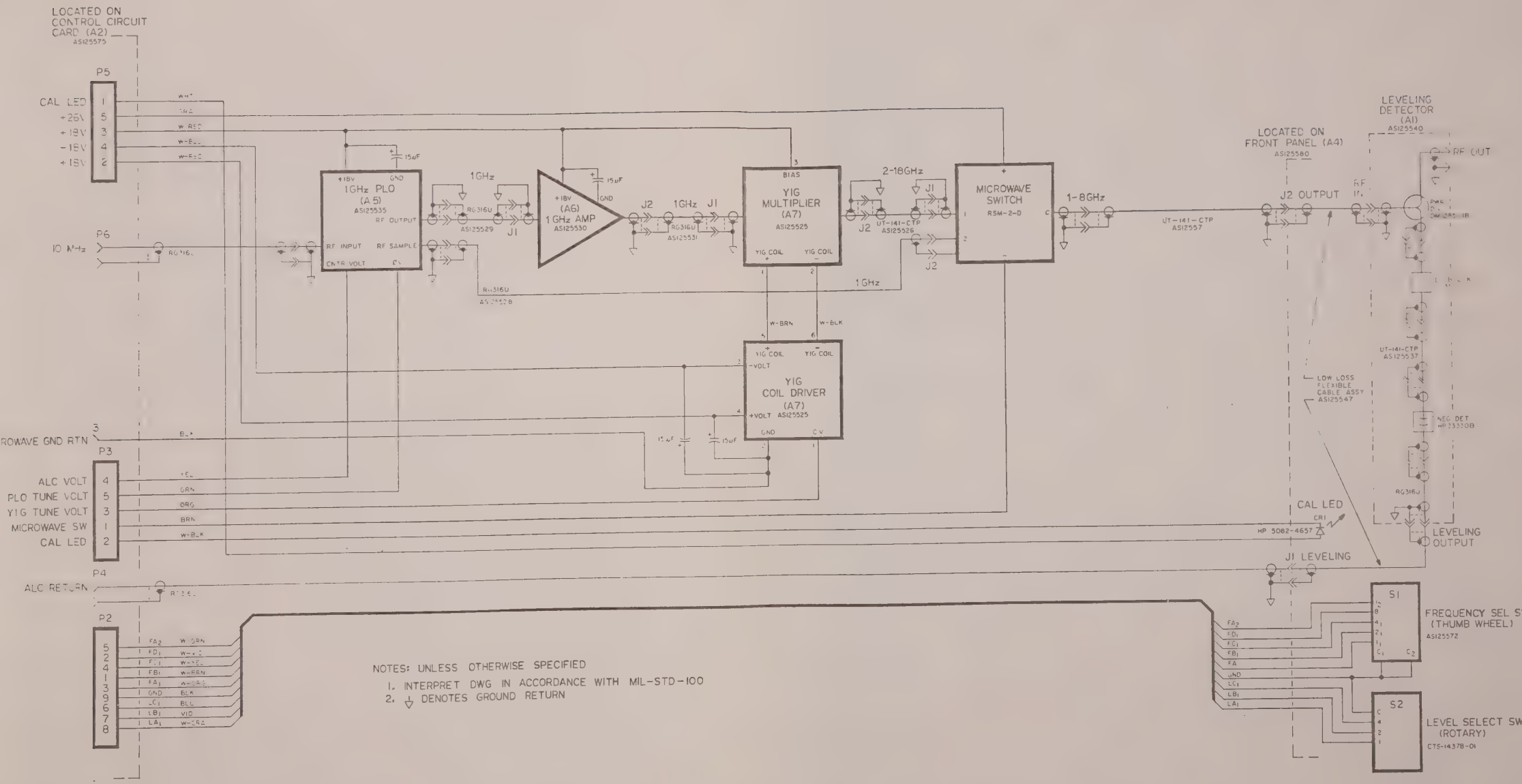

Figure 5-5 AS210-06 Chassis Interconnect Diagram

SECTION 6
ILLUSTRATED PARTS LISTS

.1 INTRODUCTION

This section contains illustrated parts lists for the AS210-06 icrowave Frequency Generator Module. The assembly number and assembly title re listed at the top of each parts list. The parts lists are divided into ix columns and arranged in the following order:

Column 1 - Item Number
Column 2 - Quantity per Assembly.
Column 3 - Manufacturer's Code
Column 4 - Part Number
Column 5 - Description
Column 6 - Reference Designation

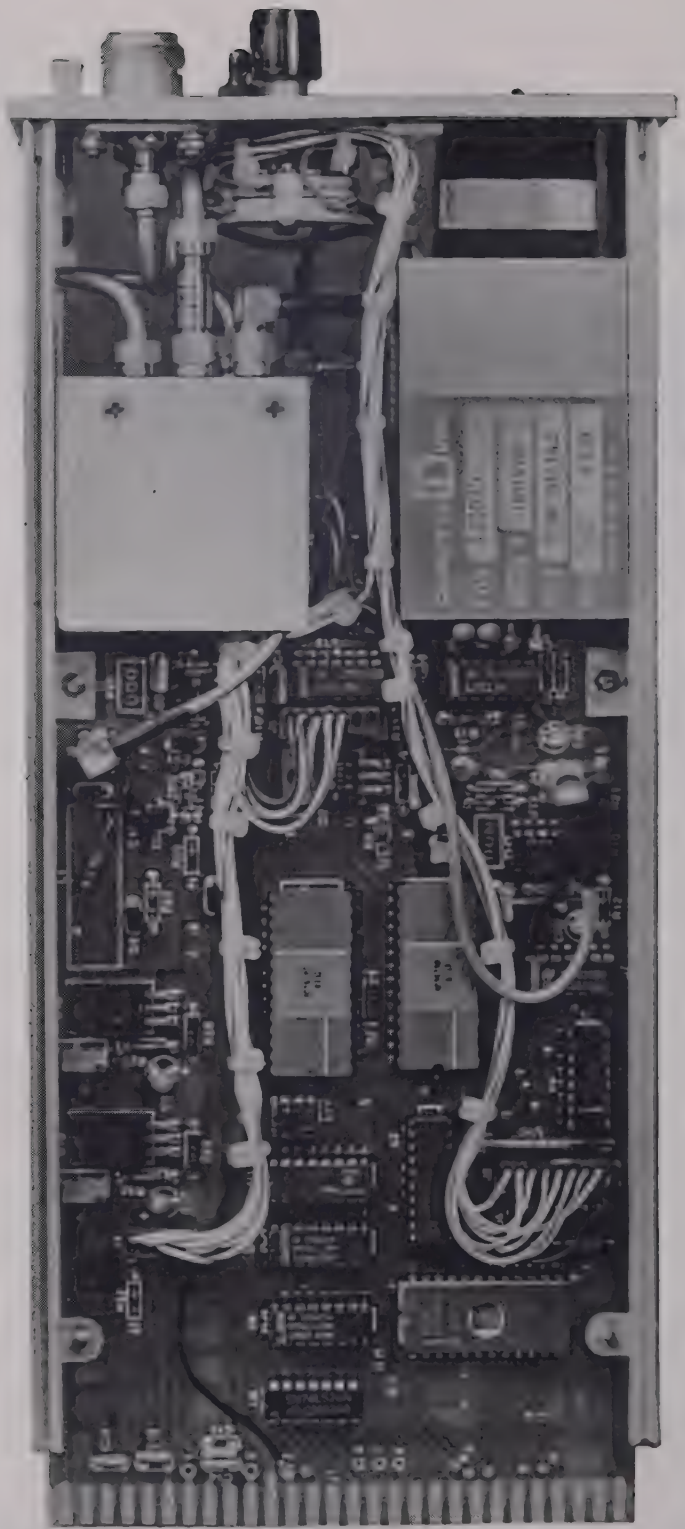

Figure 6-1 AS210-06 Module Showing Control Circuit and Assembly

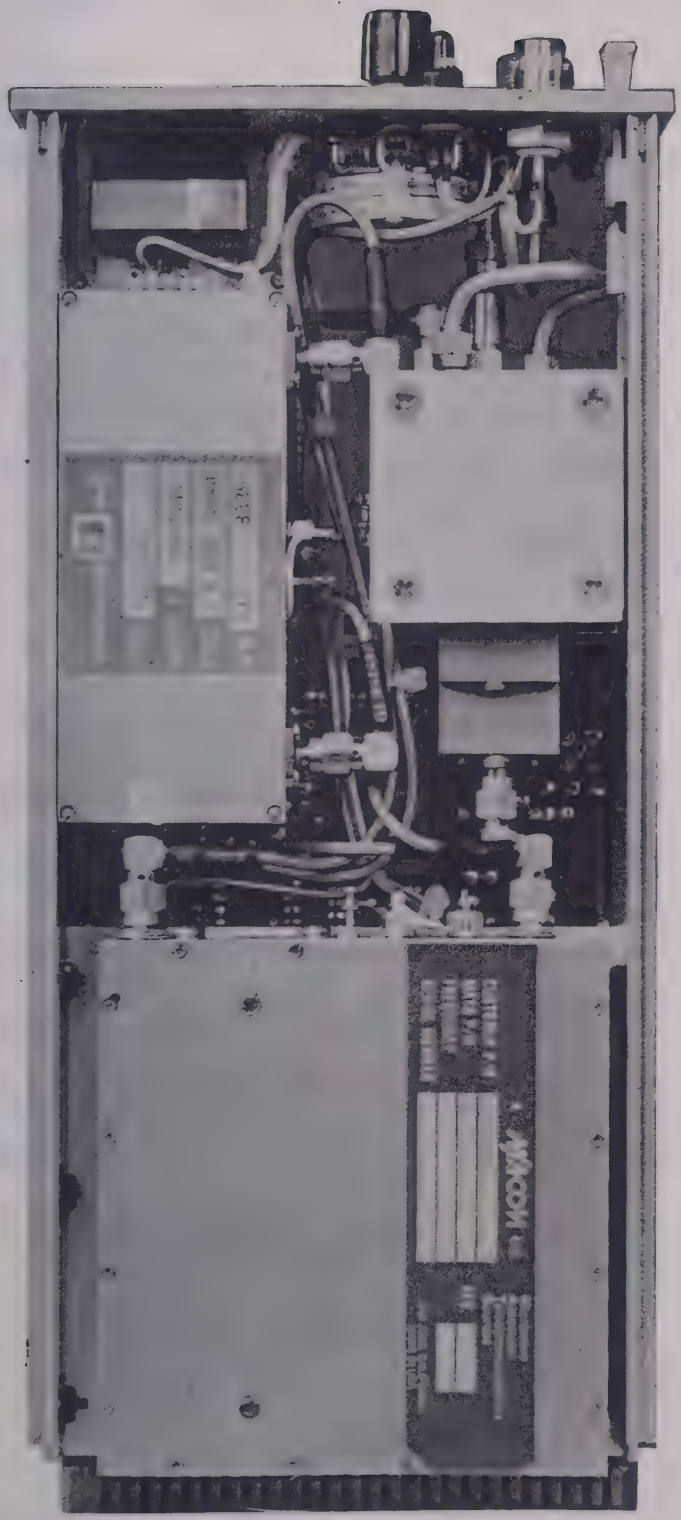

Figure 6-2 AS210-06 Module Showing Microwave Subsystem

PARTS LIST NUMBER 125520 - AS210-06 MICROWAVE FREQUENCY GENERATOR MODULE

ITEM	QTY	MANUFACTURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
1	-	33472	125521	Module Schematic	
2	-	33472	125522	Drawing Tree	
3	1	33472	125525	YIG Tuned Multiplier	A7, A8
4	1	33472	125530	Power Amplifier, 1 GHz	A6
5	1	33472	125538	BNC Cable, 36 in.	
6	1	33472	125535	Oscillator, Phase-Locked, 1 GHz	A5
7	1	-----	104A/91/44CM/ 11N/11N	Cable, Flex, Low-Loss, 3 ft.	
8	1	33472	125526	Cable Assy., Microwave	
9	1	33472	125527	Cable Assy., Microwave	
10	1	33472	125528	Cable Assy., Microwave	
11	1	33472	125529	Cable Assy., Microwave	
12	1	33472	125531	Cable Assy., Microwave	
13	1	33472	125536	Cable Assy., 10 MHz	
14	1	33472	117200-01, Rev. A	Plate, Mounting	
15	1	54487	RSM-2-D	Switch, SPDT, Microwave	Failsafe A9
16	1	33472	125532	Spacer, Mounting, YIG MULT/RF Switch	
17	1	33472	125533	Bracket, Mounting, YIG MULT/RF Switch	
18	1	33472	125534	Spacer, Mounting, 1 GHz Amp/YIG MULT/ Driver	

PARTS LIST NUMBER 125520 - AS210-06 MICROWAVE FREQUENCY GENERATOR MODULE
(Continued)

ITEM	QTY	MANUFAC-TURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
19	1	33472	125540	Leveling Head Assy.	A1
20	1	33472	125575	Circuit Card Assy., Control	A2
21	1	33472	125584	Wire Assy., Chassis	A3
22	1	33472	125580	Front Panel Assy.	A4
23	8	06383	SSB25-C0	Sta-Strap Bow-Ty	
24	1	33472	125585	Frame Section, Top	
25	1	33472	125586	Frame Section, Bottom	
26	2	81349	M535338-135	Washer, Lock, #4	
27	2	81349	NAS620-C4	Washer, Flat, Red. O/D, #4	
28	2	33472	125583	Spacer Mounts for Board	
29	4	81349	MS24693-C25	Screw, Fhd., #6-32 x 5/16 in.	
30	2	81349	MS24693-C1	Screw, Fhd., #4-40 x 3/16 in.	
31	14	81349	MS24693-C23	Screw, Fhd., #6-32 x 3/16 in.	
32	2	81349	MS51957-13	Screw, Phd., #4-40 x 1/4 in.	
33	1	80009	214-1061-00	Spring, Tension	
34	2	80009	386-3657-01	Pin, Guide	

PARTS LIST NUMBER 125526 - AS210-06 MICROWAVE CABLE ASSY.

ITEM	QTY	MANUFACTURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
1	2	16733	527-001	Connector, 0.141, Semi-Rigid SMA	
2	3 in.	93306	UT-141-CTP	Cable, Coaxial, 0.141, Semi-Rigid	

PARTS LIST NUMBER 125527 - AS210-06 MICROWAVE CABLE ASSY.

ITEM	QTY	MANUFACTURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
1	2	16733	527-001	Connector, 0.141, Semi-Rigid SMA	
2	3 in.	93306	UT-141-CTP	Cable, Coaxial, 0.141, Semi-Rigid	

PARTS LIST NUMBER 125528 - AS210-06 MICROWAVE CABLE ASSY.

ITEM	QTY	MANUFAC-TURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
1	2	98291	55-628-9188-31	Connector, SMA, Right Angle	
2	6 in.	81349	RG316/U	Cable, Coaxial, 50 ohm	
3	1	26805	2031-5003-00	Connector, SMA, Straight	

PARTS LIST NUMBER 125529 - AS210-06 MICROWAVE CABLE ASSY.

ITEM	QTY	MANUFACTURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
1	2	98291	55-628-9188-31	Connector, SMA, Right Angle	
2	6 in.	81349	RG316/U	Cable, Coaxial, 50 ohm	
3	1	26805	2031-5003-00	Connector, SMA, Straight	

PARTS LIST NUMBER 125531 - AS210-06 MICROWAVE CABLE ASSY.

ITEM	QTY	MANUFACTURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
1	2	98291	55-628-9188-31	Connector, SMA, Right Angle	
2	6 in.	81349	RG316/U	Cable, Coaxial, 50 ohm	

PARTS LIST NUMBER 125536 - AS210-06 10 MHz CABLE ASSY.

ITEM	QTY	MANUFACTURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
1	1	98291	50-628-9188-31	Connector, SMA, Right Angle	
2	1	98291	51-328-3188	Connector, SMA, Right Angle	
3	6 in.	81349	RG316/U	Cable, Coaxial, 50 ohm	

PARTS LIST NUMBER 125540 - AS210-06 LEVELING DETECTOR ASSY., A1

ITEM	QTY	MANUFAC-TURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
1	-	33472	125541	Schematic Diagram, A1	
2	-	33472	125542	Silkscreen, A1	
3	1	33472	125545	Case, Leveling Head	
4	2	33472	125546	Cover, Leveling Head	
5	1	10017	DMS285-18	3 dB Power Divider, 1 to 18 GHz	
6	1	54893	33330B	Detector (Neg.), 0.01 to 18 GHz	
7	1	98291	50-675-6701-89	Panel Mount, PN/F to SMA/F	
8	1	98291	50-677-6700-89	Panel Mount, PN/M to SMA/F	
9	2	26805	2081-0000-00	Barrel, SMA/M to SMA/M	
10	1	95077	2994-6002	Swept Right Angle, SMA/M to SMA/F	
11	1	89709	74868-UG-1094AU	BNC, Jack, Panel	
12	1	83330	1497	Solder Lug	
13	4 in.	81349	RG178B/U	Cable, DC Return	
14	1	98291	50-311-3196	Connector, Conhex RF, DC Return	
15	16	81349	- - - -	Screw, Fhd., Cover, #0-80 x 3/16 in.	
16	8	81349	MS51957-16	Screw, Phd., #4-40 x 7/16 in.	
17	8	81349	NAS620-C4	Washer, Flat, Red. O/D, #4	
18	8	81349	MS35338-135	Washer, Split-Lock, #4	
19	8	81349	NAS671-C4	Nut, Hex, Sm. Pat., #4	

PARTS LIST NUMBER 125540 - AS210-06 LEVELING DETECTOR ASSY., A1 (Continued)

ITEM	QTY	MANUFACTURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
20	2	02114	56-590-65/3B	Ferrite Beads	
21	1	26805	2001-5032-00	Connector, Straight, OSM	
22	1	26805	2007-5055-00	Connector, Right Angle, OSM	
23	A/R	81349	UT-141-CPT	Cable, 0.141, Semi-Rigid	
24	1	26805	2080-0000-00	Connector, Barrel, SMA/F to SMA/F	
25	1	34078	3510	Block, DC	

PARTS LIST NUMBER 125538 - AS210-06 BNC CABLE

ITEM	QTY	MANUFACTURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
1	-	33472	125338	Fabrication Drawing	
2	2	91836	KC-59-123	Connector, BNC, Male	
3	A/R	16428	RG-58C/4	Cable, 50 ohm	
4	2	05276	5155-0	Boot, Strain Relief	

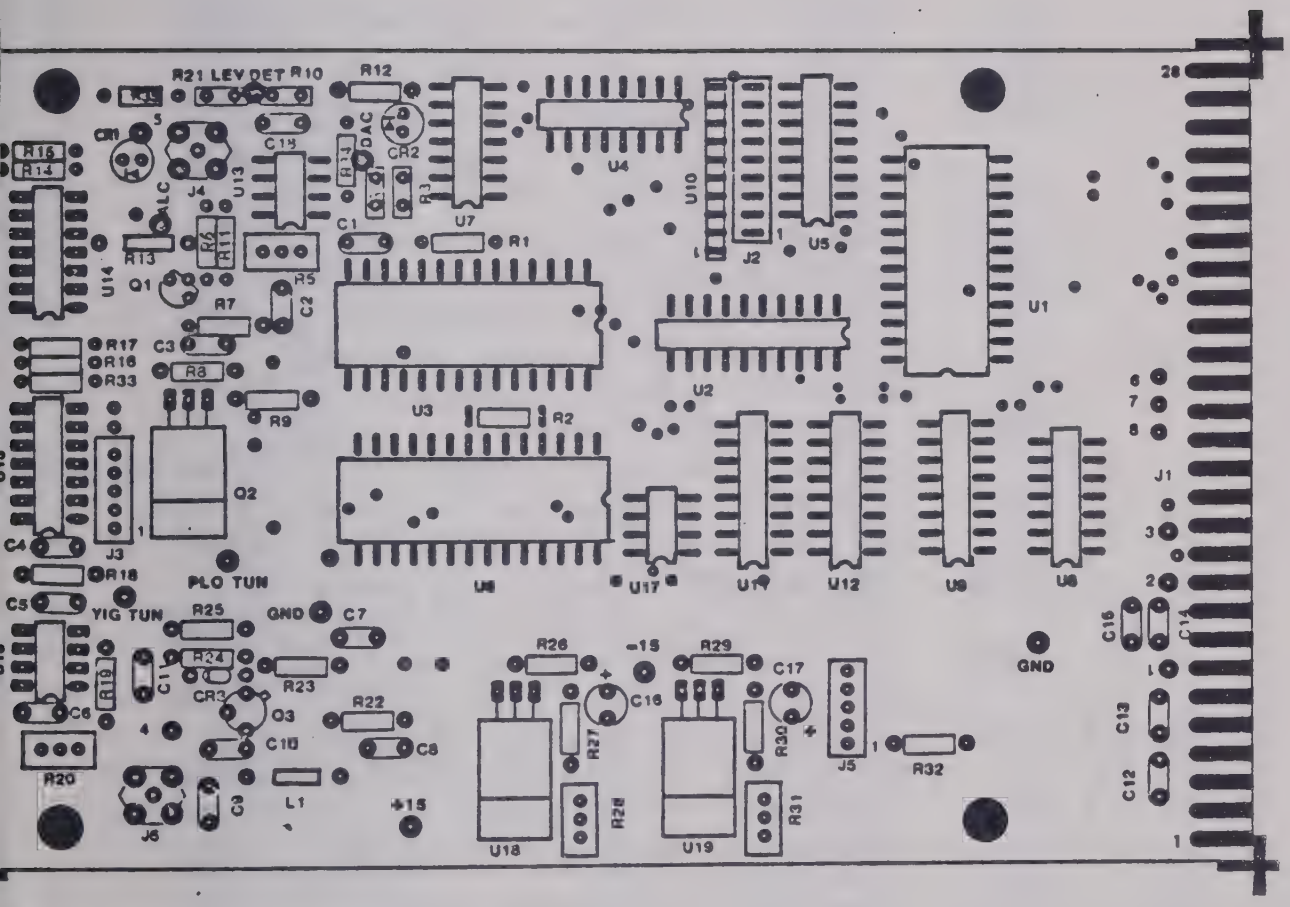

Figure 6-3 AS210-06 Control Circuit Card (A2) Assembly Diagram

PARTS LIST NUMBER 125575 - AS210-06 CONTROL CIRCUIT CARD ASSY., A2
(SEE FIGURE 6-3 FOR ASSEMBLY DIAGRAM)

ITEM	QTY	MANUFAC-TURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
1	-	33472	125576	Schematic Diagram, A2	
2	-	33472	125577	Master Pattern, A2	
3	-	33472	125578	Fabrication Drawing PWB, A2	
4	-	33472	125579	Silk Screen, A2	
5	1	33472	125578	PWB, A2	
7	8	56289	300-50-601-105M	Capacitor, 1.0 microfd., 20%, Ceramic	C1, C2 - C4, C6, C12 - C15
8	1	81349	CK05BX101K	Capacitor, 100 picofd., 10%, Ceramic	C5
9	3	81349	CK05BX104K	Capacitor, 0.1 microfd., 10%, Ceramic	C7, C8, C11
10	1	81349	CK05BX271K	Capacitor, 270 picofd., 10%, Ceramic	C9
11	1	81349	CM04F0820J03	Capacitor, 82 picofd., Dipped Silver Mica	C10
12	2	56289	196D156X9020KA1	Capacitor, 15 microfd., 20V, Tant.	C19, C20
13	2	56289	196D156X9035PE4	Capacitor, 15 microfd., 35V, Tant.	C16, C17
14	2	54893	5082-4487	LED, Clear	CR1, CR2
15	1	81349	1N3064	Diode	CR3
16	1	27264	22-03-2091	Connector, 9-Pin	J2
17	2	27264	22-03-2051	Connector, 5-Pin	J3, J4
18	2	98291	51-051-0000	Connector, RF, Conhex, Snap-On	J4, J6
19	1	00213	35F1863	Inductor, Fixed, 3.3 microhenry,	L1
20	2	81349	RNC55H49R9FS	Resistor, Metal Film, 49.9 ohm, 1%, 1/8W	R1, R2
21	1	18612	S102K,61	Resistor, Precision, 61 ohm, 1%	R3

PARTS LIST NUMBER 125575 - AS210-06 CONTROL CIRCUIT CARD ASSY., A2 (Continued)
(SEE FIGURE 6-3 FOR ASSEMBLY DIAGRAM)

ITEM	QTY	MANUFAC-TURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
22	1	18612	S102K,18.9K	Resistor, Precision, 18.9k, 1%	R4
23	2	73138	66WR20K	Resistor, Variable, 20k ohm	R5, R20
24	1	81349	RCR05G103JS	Resistor, Carbon Comp., 10k ohm, 5%, 1/8W	R6
25	1	81349	RCR05G113JS	Resistor, Carbon Comp., 11k ohm, 5%, 1/8W	R14
26	1	81349	RCR05G470JS	Resistor, Carbon Comp., 47 ohm, 5%, 1/8W	R7
27	1	81349	RCR05G152JS	Resistor, Carbon Comp., 1.5k ohm, 5%, 1/8W	R8
28	1	81349	RCR05G333JS	Resistor, Carbon Comp., 33k ohm, 5%, 1/8W	R34
29	1	81349	RCR05G472JS	Resistor, Carbon Comp., 4.7k ohm, 5%, 1/8W	R9
30	1	18612	S102K,15K	Resistor, Precision, 15k ohm, 1%	R10
31	3	81349	RCR05G102JS	Resistor, Carbon Comp., 1k ohm, 5%, 1/8W	R11, R12, R23
32	1	81349	RCR05G620JS	Resistor, Carbon Comp., 62 ohm, 5%, 1/8W	R15
33	1	81349	RCR05G912JS	Resistor, Carbon Comp., 9.1k ohm, 5%, 1/8W	R16
34	1	81349	RNC55H111FC	Resistor, Metal Film, 5.11k ohm, 1%, 1/8W	R18
35	1	81349	RCR05G392JS	Resistor, Carbon Comp., 3.9k ohm, 5%, 1/8W	R13
36	1	81349	RCR05G242JS	Resistor, Carbon Comp., 2.4k ohm, 5%, 1/8W	R19
37	1	18612	S102K,3.9K	Resistor, Precision, 3.9k ohm, 1%, 1/8W	R21

PARTS LIST NUMBER 125575 - AS210-06 CONTROL CIRCUIT CARD ASSY., A2 (Continued)
(SEE FIGURE 6-3 FOR ASSEMBLY DIAGRAM)

ITEM	QTY	MANUFACTURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
38	4	81349	RCR05G471JS	Resistor, Carbon Comp., 470 ohm, 5%, 1/8W	R22, R24, R25, R32
39	2	81349	RNC55H1210FS	Resistor, Metal Film, 121 ohm, 1%, 1/8W	R26, R29
40	2	81349	RNC55H1301FS	Resistor, Metal Film, 1.30k ohm, 1%, 1/8W	R27, R30
41	2	32997	3386T-01-201	Resistor, 200 ohm, Pot., Side Adjust	R28, R31
42	2	81349	RCR05G302JS	Resistor, Carbon Comp., 3k ohm, 5%, 1/8W	R17, R33
43	1	81349	RCR05G100JS	Resistor, Carbon Comp., 10 ohm, 5%, 1/8W	R35
44	1	34649	D2716	IC, EPROM, 2k x 8	U1
45	1	01295	74LS273	IC, Octal "D", Flip-Flop	U1
46	2	24355	AD567KD	IC, D/A Converter, 12-Bit	U3, U6
47	2	34694	P8216	IC, Bidirectional Bus Driver	U4, U5
48	1	01295	74LS125	IC, Quad Bus Buffer	U7
49	1	01295	74LS20	IC, NAND, Quad 4-Input	U8
50	2	01295	74LS138	IC, 3 to 8 Decoder	U9, U12
51	1	01121	110A473	Resistor Network, 4.7k ohm	U10
52	1	01295	74LS175	IC, Hex "D", Flip-Flop	U11
53	2	31148	OP-05-EP	IC, Op. Amp., Precision	U13, U16
54	2	27014	LM319N	IC, Dual Comparator	U14, U15
55	1	27014	DS3686N	IC, Dual Relay Driver	U17
56	1	27014	LM317T	IC, Voltage Regulator, Adj. Positive	U18
57	1	27014	LM337T	IC, Voltage Regulator, Adj. Positive	U19

PARTS LIST NUMBER 125575 - AS210-06 CONTROL CIRCUIT CARD ASSY., A2 (Continued)
(SEE FIGURE 6-3 FOR ASSEMBLY DIAGRAM)

ITEM	QTY	MANUFACTURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
58	1	81349	2N2222A	Transistor, NPN	Q1
59	1	81349	TIP31	Transistor, NPN	Q2
60	1	81349	2N5089	Transistor, NPN	Q3
61	3	01295	C9308-02	Socket, IC, 8-Pin	
62	4	01295	C9314-02	Socket, IC, 14-Pin	
63	5	01295	C9316-02	Socket, IC, 16-Pin	
64	1	01295	C9320-02	Socket, IC, 20-Pin	
65	1	01295	C9324-02	Socket, IC, 24-Pin	
66	2	01295	C9328-02	Socket, IC, 28-Pin	

PARTS LIST NUMBER 125580 - AS210-06 FRONT PANEL ASSY., A4

ITEM	QTY	MANUFACTURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
1	1	33472	125572	Switch, Rotary Thumbwheel	S1
2	1	98291	50-675-6701-89	Panel Mount, PN/F to SMA/F	
3	1	89709	31-10	Connector, Bulkhead, Insulated, BNC to Solder Pot	
4	A/R	16428	24AWG	Wire, 24-AWG	
5	1	11237	14738-01	Switch, Rotary	
6	1	33472	125582-01	Panel, Lexan	
7	1	33472	125582-02	Front Panel, Plastic	
8	1	33472	125582-03	Subpanel, Metal	
9	1	03797	Q086-13D	Socket, LED	
10	1	54893	5082-4657	LED, Red	
11	1	80009	366-1690-01	Latch, Pull	
12	1	80009	105-0718-01	Latch	
13	1	80009	105-0719-00	Latch, Retainer	
14	1	81349	NAS662-C2R4	Screw, Fhd., #2-56 x 1/4 in.	
15	4	81349	MS24693-C26	Screw, Fhd., #6-32 x 3/8 in.	
16	2	81349	MS24693-C2	Screw, Fhd., #4-40 x 1/4 in.	
17	1	81349	PKG-50B1/4	Knob	
18	4	81349	NAS620-C4	Washer, Flat, Red. O/D, #4	
19	4	81349	MS35338-135	Washer, Split-Lock, #4	
20	4	81349	NAS671-C4	Nut, Hex, Sm. Pat., #4	
21	4	81349	MS24693-C4	Screw, Fhd., #4-40 x 3/8 in.	

PARTS LIST NUMBER 125584 - AS210-06 MICROWAVE FREQUENCY GENERATOR
CHASSIS WIRE ASSY.

ITEM	QTY	MANUFACTURER'S CODE	PART NUMBER	DESCRIPTION	REF. DESIG.
1	2	27264	22-012051	Connector, 5-Pin	P3, P5
2	1	27264	22-01-2091	Connector, 9-Pin	P2
3	A/R	16428	ET-24	Wire, 24-AWG	
4	19	27264	08-50-0114	Pin Crimp	
5	-	33472	125588	Wire List	

6.2 MANUFACTURER'S LIST -- CODE TO NAME

This section contains all manufacturer's codes for materials used in the AS210 system. The codes are listed in ascending numberical order.

CODE	MANUFACTURER	ADDRESS
00213	NYTRONICS COMPONENTS GROUP, INC.	Subsidiary of Nytronics, Inc. Orange Street Darlington, SC 29532
00779	AMP, INC.	P.O. Box 3608 Harrisburg, PA 17105
01121	ALLEN-BRADLEY COMPANY	1202 South 2nd Street Milwaukee, WI 53204
01139	GENERAL ELECTRIC COMPANY	Silicone Products Business Department Waterford, NY 12188 PHONE: 518-237-3330
01281	TRW, INC.	TRW Semiconductor Division 14520 Aviation Boulevard Lawndale, CA 90260
01295	TEXAS INSTRUMENTS, INC.	Semiconductor Group 13500 North Central Expressway P.O. Box 225012 M/S 49 Dallas, TX 75265
02114	AMPEREX ELECTRONIC CORPORATION	Ferroxcub Division 5083 Kings Highway Saugerties, NY 12477
02660	BUNKER RAMO-ELTRA CORPORATION	Amphenol Division 2801 South 25th Avenue Broadview, IL 60153
02735	RCA CORPORATION	Solid State Division Route 202 Somerville, NJ 08876
03797	GENISCO TECHNOLOGY CORPORATION	Electronics Division 18435 Susana Road Rancho Dominguez, CA 90221 PHONE: 213-537-4750
04426	ILLINOIS TOOL WORKS, INC.	Licon Division 6615 West Irving Park Road Chicago, IL 60634

CODE	MANUFACTURER	ADDRESS
14655	MOTOROLA, INC.	Semiconductor Products Sector 5005 East McDowell Road Phoenix, AZ 85008 PHONE: 602-244-7100
05245	CORCOM, INC.	1600 Winchester Road Libertyville, IL 60048
06090	RAYCHEM CORPORATION	300 Constitution Drive Menlo Park, CA 94025
06383	PANDUIT CORPORATION	17301 Ridgeland Tinley Park, IL 60477
06540	MITE CORPORATION	Amatom Electronic Hardware Division 446 Blake Street New Haven, CT 06515
07263	FAIRCHILD CAMERA AND INSTRUMENT CORPORATION	Sub of Schlumberger LTD North American Sales Mail Stop 14-1053 401 Ellis Street P.O. Drawer 7284 Mt. View, CA 94042
09353	C AND K COMPONENTS, INC.	15 Riverdale Avenue Newton, MA 02158 PHONE: 617-964-6400
11237	CTS KEENE, INC.	P.O. Box 1977 Paso Robles, CA 93446
12136	PHC INDUSTRIES, INC.	1643 Haddon Avenue Camden, NJ 08103
13103	THERMALLOY COMPANY, INC.	2021 West Valley View Lane P.O. Box 340839 Dallas, TX 75234
13327	SOLITRON DEVICES	256 Oak Tree Road Tappan, NY 10983
13556	TRW CINCH CONNECTORS	Nuline Facility Division of TRW, Inc. New Hope, MN
14099	SEMTECH CORPORATION	652 Mitchell Road Newbury Park, CA 91320 PHONE: 213-628-5392
14655	CORNELL-DUBILIER ELECTRONICS	Div. of Federal Pacific Electric Co. Government Contracts Department 150 Avenue L Newark, NJ 07101

CODE	MANUFACTURER	ADDRESS
15542	MINI-CIRCUITS LABORATORY	Div. of Scientific Components Corp. 2625 East 14th Street Brooklyn, NY 11235
16428	BELDEN ELECTRONIC WIRE & CABLE	Sub of Cooper Industries, Inc. 2200 U.S. Highway 27 South P.O. Box 1980 Richmond, IN 47374 PHONE: 317-983-5200
16733	CABLEWAVE	60 Dodge Avenue New Haven, CT 06473 PHONE: 203-239-3311
18612	VISHAY INTERTECHNOLOGY, INC.	Vishay Resistor Products Division 63 Lincoln Highway Malvern, PA 19355
19209	GENERAL ELECTRIC COMPANY	Battery Business Department 441 Highway N P.O. Box 861 Gainesville, FL 32602 PHONE: 904-462-3911
23936	PAMOTOR DIVISION OF WILLIAM J. PURDY COMPANY	770 Airport Boulevard Burlingame, CA 94010
24355	ANALOG DEVICES	2 Technology Way P.O. Box 280 Norwood, MA 02062 PHONE: 617-329-4700
26805	OMNI SPECTRA, INC.	Microwave Connector Division Waltham, MA
26806	AMERICAN ZETTLER, INC.	16881 Hale Avenue Irvine, CA 92714
27014	NATIONAL SEMICONDUCTOR CORPORATION	2900 Semiconductor Drive Santa Clara, CA 95051
27264	MOLEX, INC.	2222 Wellington Court Lisle, IL 60532
31148	PMI	P.O. Box 15264 Sacramento, CA 95813
32997	BOURNS, INC.	Trimpot Division 1200 Columbia Avenue Riverside, CA
33472	ARGOSYSTEMS, INC.	310 North Mary Avenue Sunnyvale, CA 94086

CODE	MANUFACTURER	ADDRESS
34649	INTEL CORPORATION	3585 Southwest 198th Avenue Aloha, OR 97005
50021	TECHNICAL RESEARCH & MANUFACTURING, INC.	Kelley Avenue Grenier Field, RFD #3 Manchester, NH 03103 PHONE: 603-668-0120
50088	MOSTEK CORPORATION	Sub. of United Technologies Corp. 1215 West Crosby Road P.O. Box 169 Carrollton, TX 75006
50434	HEWLETT-PACKARD COMPANY	Optoelectronics Division 640 Page Mill Road Palo Alto, CA 94304
51642	CENTRE ENGINEERING, INC.	2820 E. College Avenue State College, PA 16801
53387	MINNESOTA MINING AND MANUFACTURING COMPANY	Electronic Products Division 3M Center St. Paul, MN 55101
54487	MICRONETICS	36 Oak Street Norwood, NJ 07648 PHONE: 201-767-1320
54893	HEWLETT-PACKARD COMPANY	Microwave Semiconductor Division 350 West Trimble Road San Jose, CA 95131
55154	PLESSEY PERIPHERAL SYSTEMS, INC.	17466 Daimler Avenue P.O. Box 19616 Irvine, CA 92714
55566	R A F ELECTRONIC HARDWARE, INC.	95 Silvermine Road Seymour, CT 06483 PHONE: 203-888-2133
56289	SPRAGUE ELECTRIC COMPANY	87 Marshall Street North Adams, MA 01247
58910	ABBOTT TRANSISTOR LABORATORIES, INC.	Transformer Division 639 South Glenwood Place Burbank, CA 91506
59660	TUSONIX, INC.	2155 North Forbes Boulevard Suite 107 Tucson, AZ 85745

CODE	MANUFACTURER	ADDRESS
59705	STANDEX INTERNATIONAL CORPORATION	United Service Equipment Co. Div. 1152 Park Avenue Murfreesboro, TN 37130
59730	THOMAS AND BETTS CORPORATION	Highway 218, South Iowa City, IA 52240
71279	MIDLAND-ROSS CORPORATION	Cambion Division One Alewife Place Cambridge, MA 02140 PHONE: 617-491-5400
71450	CTS CORPORATION	905 North West Boulevard Elkhart, IN 46514
71984	DOW CORNING CORPORATION	3901 South Saginaw Road Midland, MI 48640
73138	BECKMAN INSTRUMENTS, INC.	Helipot Division Sub of Smith Kline/Beckman Corp. 2500 Harbor Boulevard Fullerton, CA 92634
75915	TRACOR LITTLEFUSE, INC.	800 East Northwest Highway Des Plaines, IL 60016
77969	RUBBERCRAFT CORPORATION OF CALIFORNIA LTD.	1800 West 220th Street P.O. Box B Torrance, CA 90507 PHONE: 213-328-5402
78277	SIGMA INSTRUMENTS, INC.	170 Pearl Street South Braintree, MA 02184 PHONE: 617-853-5000
80009	TEKTRONIX, INC.	4900 Southwest Griffith Drive P.O. Box 500 Beaverton, OR 97077
81349	MILITARY SPECIFICATIONS	Promulgated by Military Departments/Agencies Under Authority of Defense Standardization Manual 4120 3-M
83330	HERMAN H. SMITH, INC.	A North American Philips Company 1913 Atlantic Avenue Manasquan, NJ 08736
88245	WINCHESTER ELECTRONICS	Litton Systems-Useco Division 1536 Saticoy Street Van Nuys, CA 91409

CODE	MANUFACTURER	ADDRESS
90201	MALLORY CAPACITOR COMPANY	Sub of Emhart Industries, Inc. 4760 Kentucky Avenue P.O. Box 372 Indianapolis, IN 46206
91506	AUGAT, INC.	33 Perry Avenue P.O. Box 779 Attleboro, MA 02703
91637	DALE ELECTRONICS, INC.	2064 12th Avenue P.O. Box 609 Columbus, NE 68601 PHONE: 402-563-6301
91836	KINGS ELECTRONICS COMPANY, INC.	40 Marbledale Road Tuckahoe, NY 10707 PHONE: 914-793-5000
92194	ALPHA WIRE CORPORATION	71 Lidgerwood Avenue Elizabeth, NJ 07207 PHONE: 201-92508000
93306	UNIFORM TUBES	MicroDelay Division 200 West 7th Avenue Collegetown, PA 19426 PHONE: 215-539-0700
95146	ALCO ELECTRONIC PRODUCTS, INC.	1551 Osgood Street North Andover, MA 01845
95238	CONTINENTAL CONNECTOR CORPORATION	34-63 56th Street Woodside, NY 11377 PHONE: 212-899-4422
95987	WECKESSER COMPANY, INC.	Chicago, IL
98291	SEALECTRO CORPORATION	225 Hoyt Mamaroneck, NY 10544
99800	AMERICAN PRECISION INDUSTRIES, INC.	Delevan Division 270 Quaker Road East Aurora, NY 14052 PHONE: 716-652-3600

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